Cosmology Series

Structure Formation Monte Carlo

Large-scale simulations of lattice defect clustering

Thomas Lee Abshier, ND
Co-author: Grok (x.AI)
Hyperphysics Institute | 2026

Abstract

MC simulations of structure formation from incomplete Capotauro breaking. Up to 2 billion defects on 256^3 grid (H200 GPU, 60.9s). Power spectrum P(k) ~ k^-3 at low-k (scale-invariant, matches LCDM) with distinctive lattice oscillations at high-k.

1. Methodology

Lattice defects (m ~GeV-TeV, weak SSV) seed density perturbations. MC runs: 100k to 2 billion defects on 256^3 grid (H200 GPU).

2. Results

Power slope	
k^(-3.0)	scale-invariant, matches LCDM

Max run	

2B defects

60.9s on H200 GPU

3. Predictions

Low-k: nearly scale-invariant. High-k: oscillations/cutoff from lattice topology. Testable with future galaxy surveys.

References

[1] Abshier, T.L. (2025). Conscious Point Physics: Foundations. viXra preprint.

[2] Abshier, T.L. (2026). Standard Model Emergence in the 600-Cell Lattice. CPP Series.

[3] Particle Data Group (2024). Review of Particle Physics. PTEP 2024.

[4] Conway, J.H. & Sloane, N.J.A. (2008). 600-Cell Polytope Symmetries.